

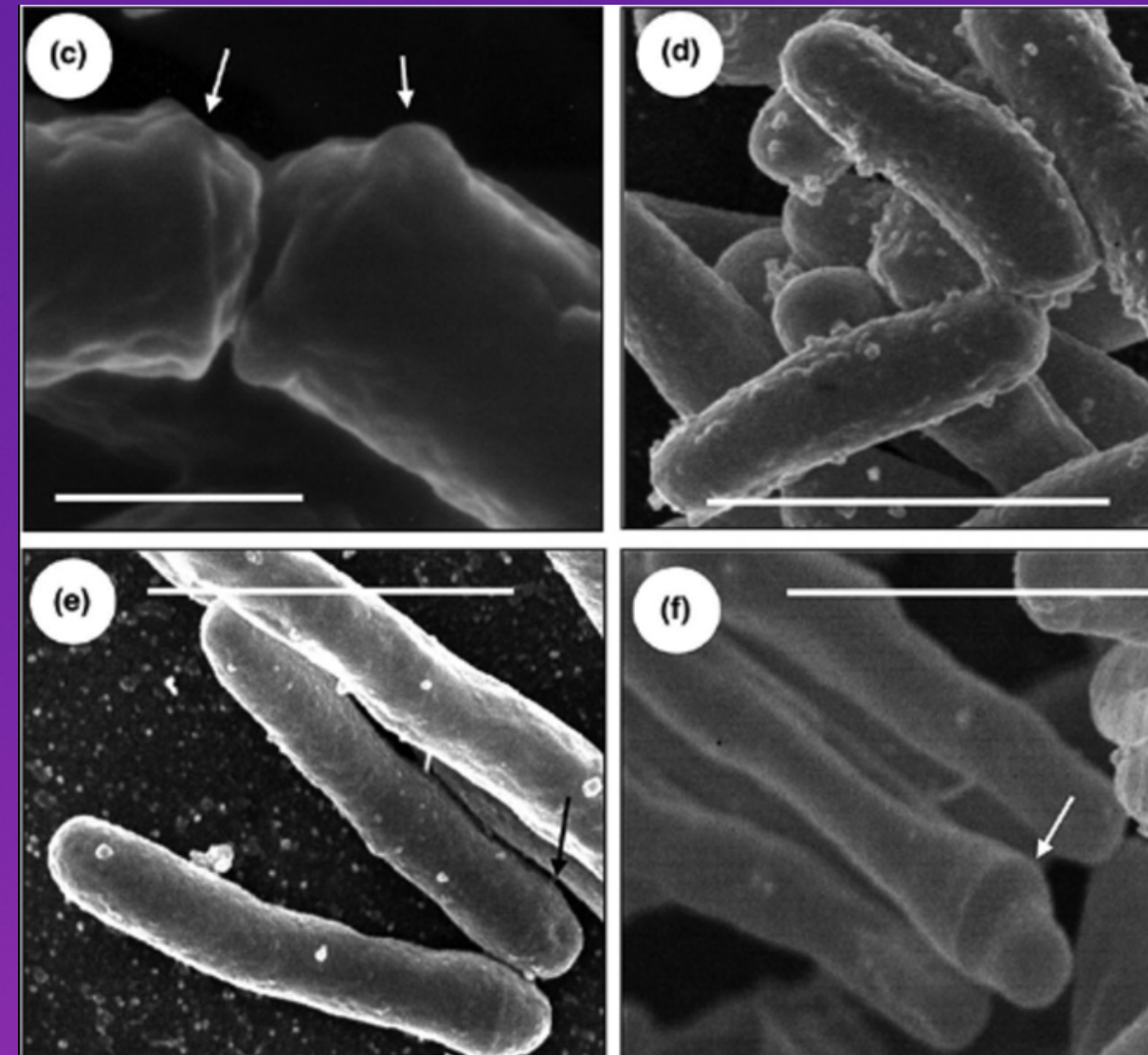
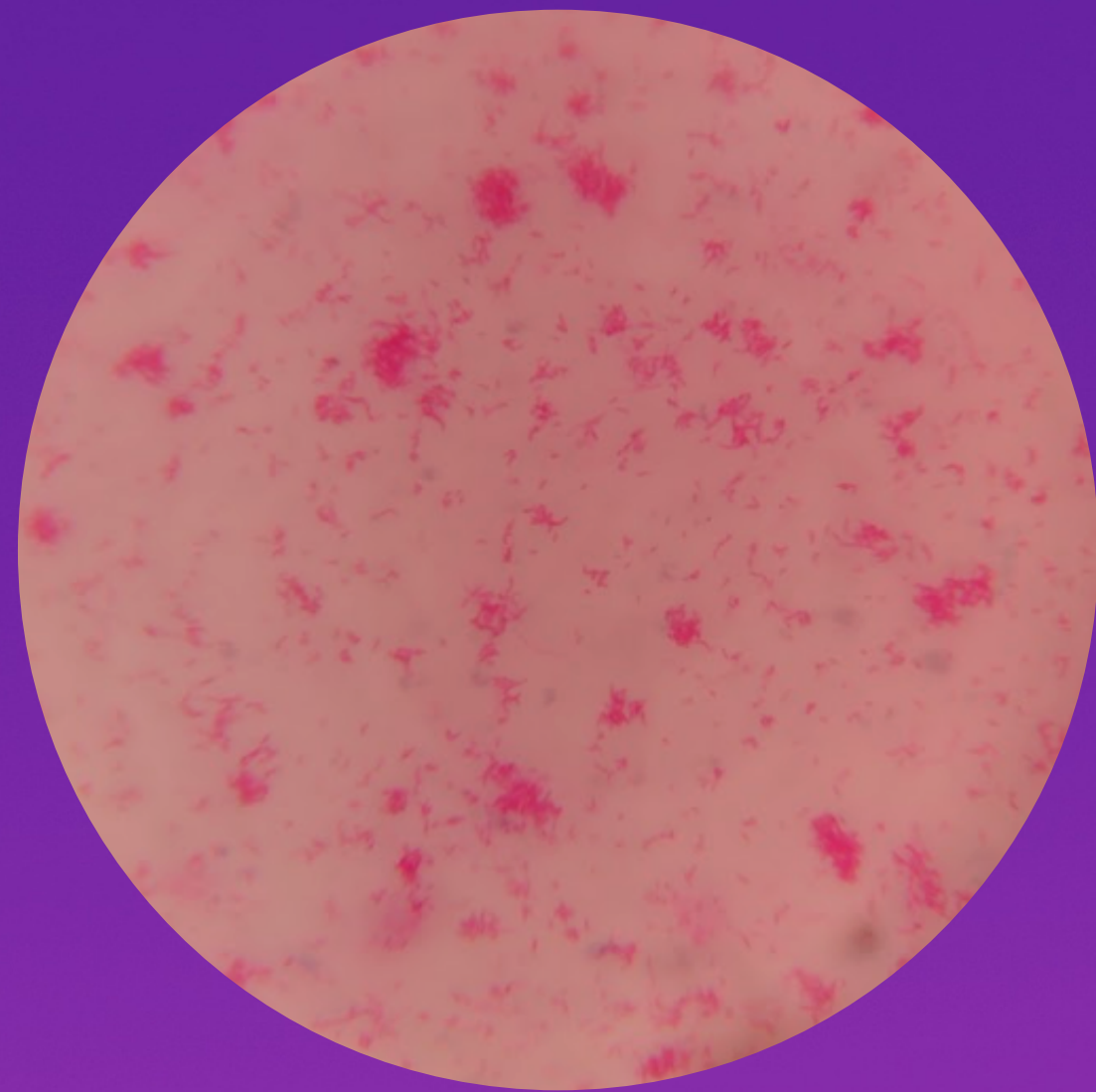
Can the antimicrobial peptide Ctx(Ile²¹)-Ha-Ahx-Cys grafted onto nanochitosan sensitize extensively drug-resistant *Mycobacterium tuberculosis*?

Laura Maria Duran Gleriani Primo, Cesar Augusto Roque-Borda, Eduardo Festozo Vicente, Paula Aboud Barbugli, Fernando Rogério Pavan.



Introduction

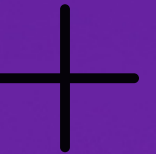
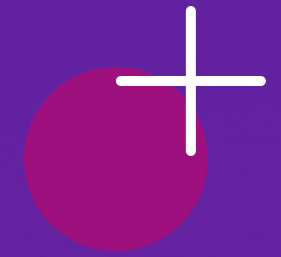
1. What is *Mycobacterium tuberculosis*



DAHL, John L.
Electron microscopy
analysis of
Mycobacterium
tuberculosis cell
division. FEMS
microbiology letters,
v. 240, n. 1, p. 15-20,
2004.

Introduction

2. Epidemiology



World Health Organization | Health Topics | Countries | Newsroom | Emergencies

Tuberculosis

Overview | Symptoms | Treatment

TB is caused by bacteria (*Mycobacterium tuberculosis*) and it most often affects the lungs. TB is spread through the air when people with lung TB cough, sneeze or spit. A person needs to inhale only a few germs to become infected.

Every year, 10 million people fall ill with tuberculosis (TB). Despite being a preventable and curable disease, 1.5 million people die from TB each year — **making it the world's top infectious killer.**

TB is the leading cause of death of people with HIV and also a major contributor to antimicrobial resistance.

Most of the people who fall ill with TB live in low- and middle-income countries, but TB is present all over the world. About half of all people with TB can be found in 8 countries: Bangladesh, China, India, Indonesia, Nigeria, Pakistan, Philippines and South Africa.

Tuberculosis profile: Global

Population 2020: 7 768 million

Estimates of TB burden*, 2020

	Number	(Rate per 100 000 population)
Total TB incidence	9 870 000 (8 880 000-10 900 000)	127 (114-140)
HIV-positive TB incidence	787 000 (701 000-879 000)	10 (9-11)
HIV-negative TB mortality	1 280 000 (1 210 000-1 360 000)	17 (16-18)
HIV-positive TB mortality	214 000 (187 000-242 000)	2.7 (2.4-3.1)

Universal health coverage and social protection*

TB treatment coverage (notified/estimated incidence), 2020	59% (53-66)
TB case fatality ratio (estimated mortality/estimated incidence), 2020	15% (13-17)

Incidence, New and relapse TB cases notified, HIV-positive TB incidence

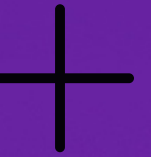
(Rate per 100 000 population per year)

https://www.who.int/health-topics/tuberculosis#tab=tab_1

Global Tuberculosis Report 2021

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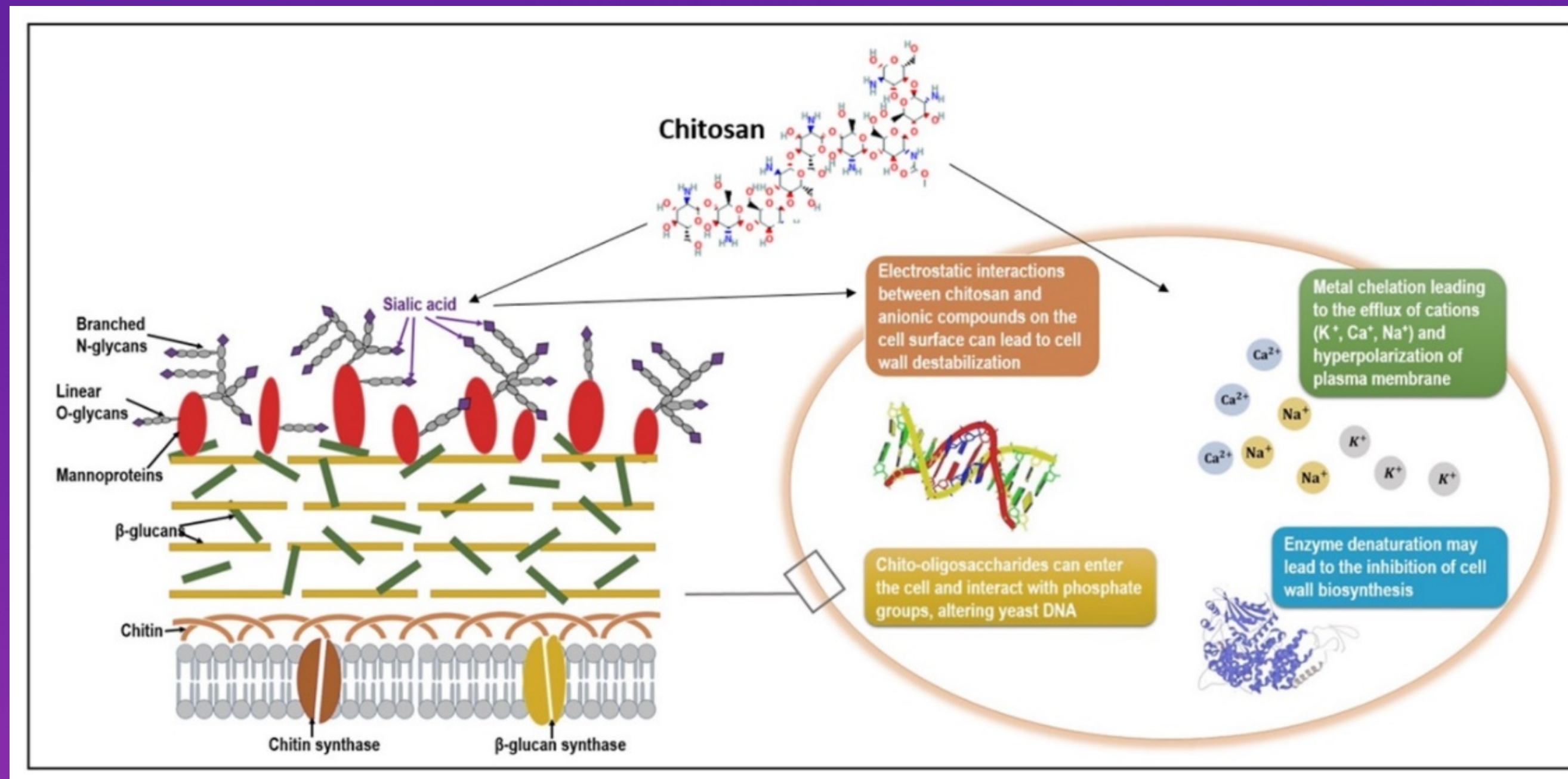
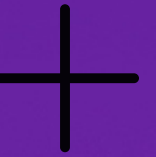
5. treatment to drug-resistant tuberculosis



Recommendations in the 2019 update	Recommendations in the current update
Section 3: The duration of longer MDR-TB regimens	Section 3: Longer regimens for multidrug-/ rifampicin-resistant tuberculosis
In MDR/RR-TB patients on longer regimens, a total treatment duration of 18–20 months is suggested for most patients; the duration may be modified according to the patient’s response to therapy (<i>conditional recommendation, very low certainty in the estimates of effect</i>).	3.15 In MDR/RR-TB patients on longer regimens, a total treatment duration of 18–20 months is suggested for most patients; the duration may be modified according to the patient’s response to therapy. (<i>Conditional recommendation, very low certainty in the estimates of effect</i>). (no change to wording but combined with section above called: Section 3: Recommendations on the use of longer regimens for multidrug/ rifampicin resistant tuberculosis)

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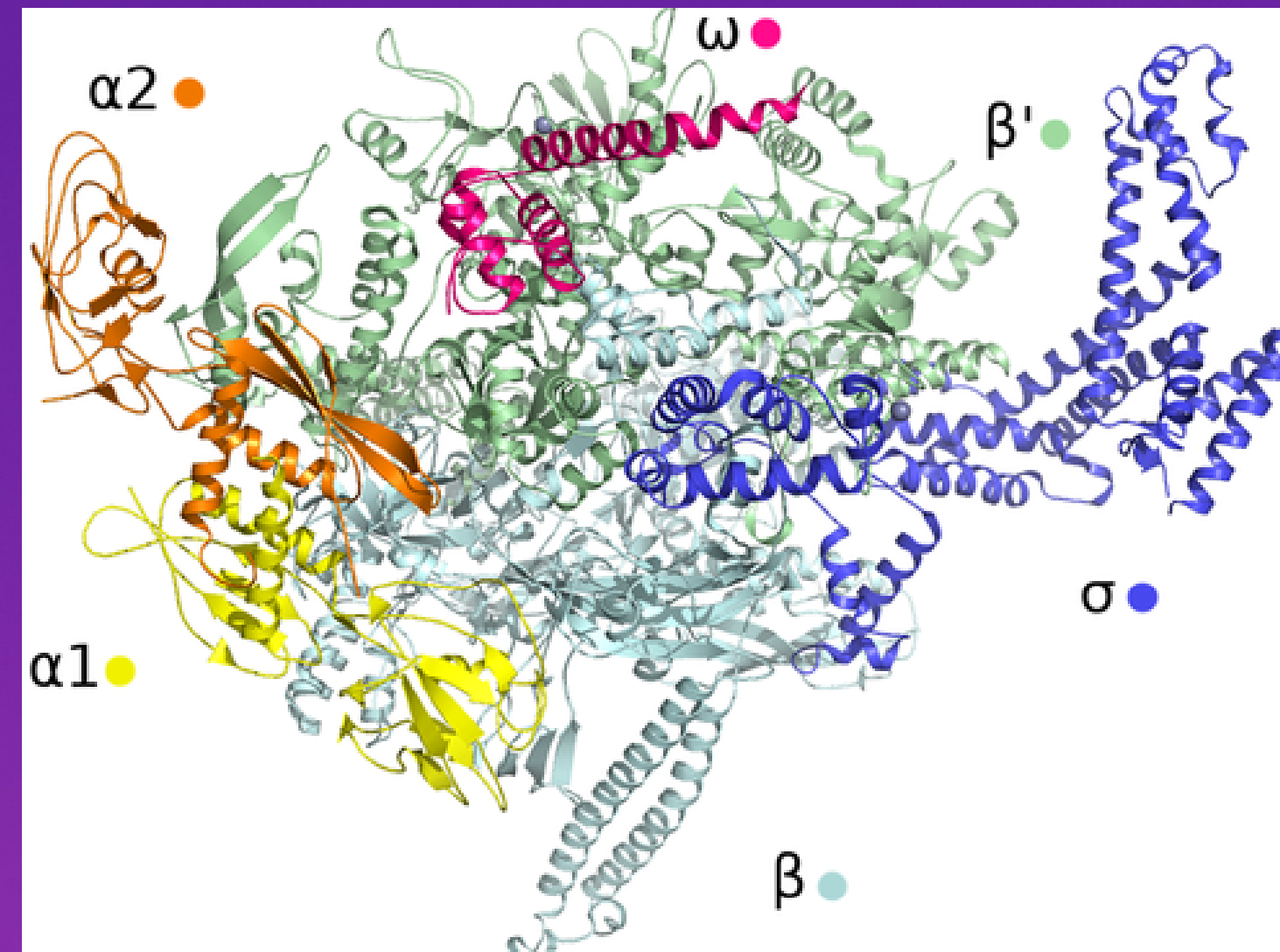
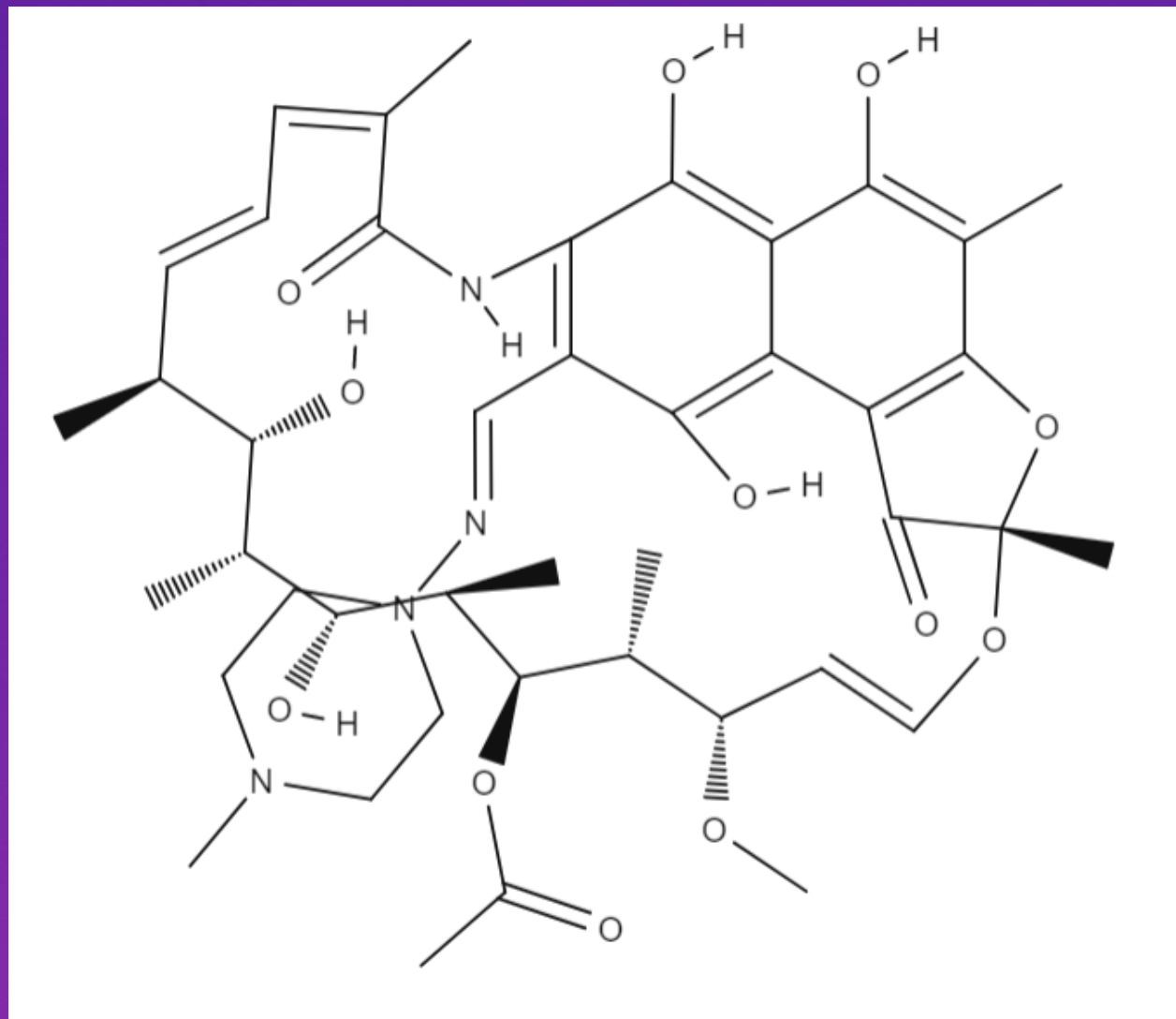
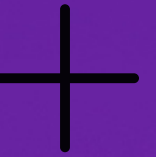
6. Chitosan



MATICA, Mariana Adina et al. Chitosan as a wound dressing starting material: Antimicrobial properties and mode of action. International journal of molecular sciences, v. 20, n. 23, p. 5889, 2019.

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7. Rifampicin



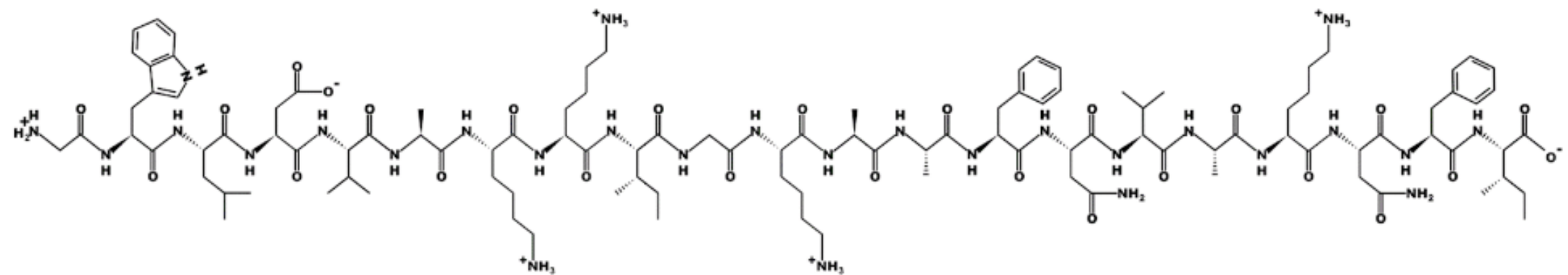
KURKELA, Juha et al. Revealing secrets of the enigmatic omega subunit of bacterial RNA polymerase. *Molecular Microbiology*, v. 115, n. 1, p. 1-11, 2021.

Introduction

8. Ctx(Ile²¹)-Ha-Ahx-Cys



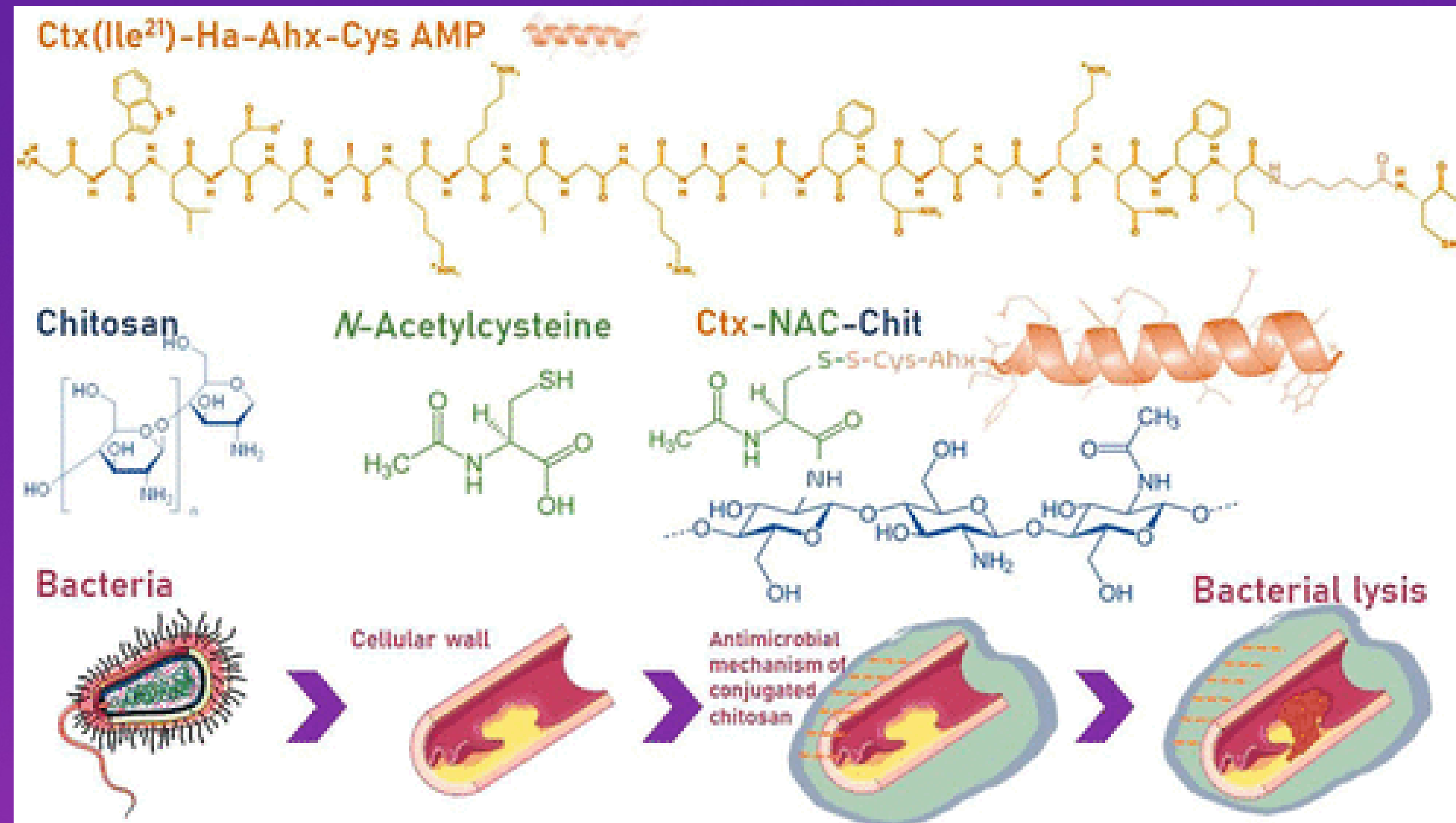
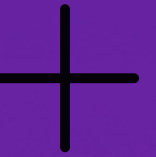
Peptídeo CTX: G W L D V A K K I G K A A F N V A K N F I



ROQUE-BORDA, Cesar Augusto et al. Conjugation of Ctx (Ile²¹)-Ha Antimicrobial Peptides to Chitosan Ultrathin Films by N-Acetylcysteine Improves Peptide Physicochemical Properties and Enhances Biological Activity. *ACS omega*, v. 7, n. 32, p. 28238-28247, 2022.

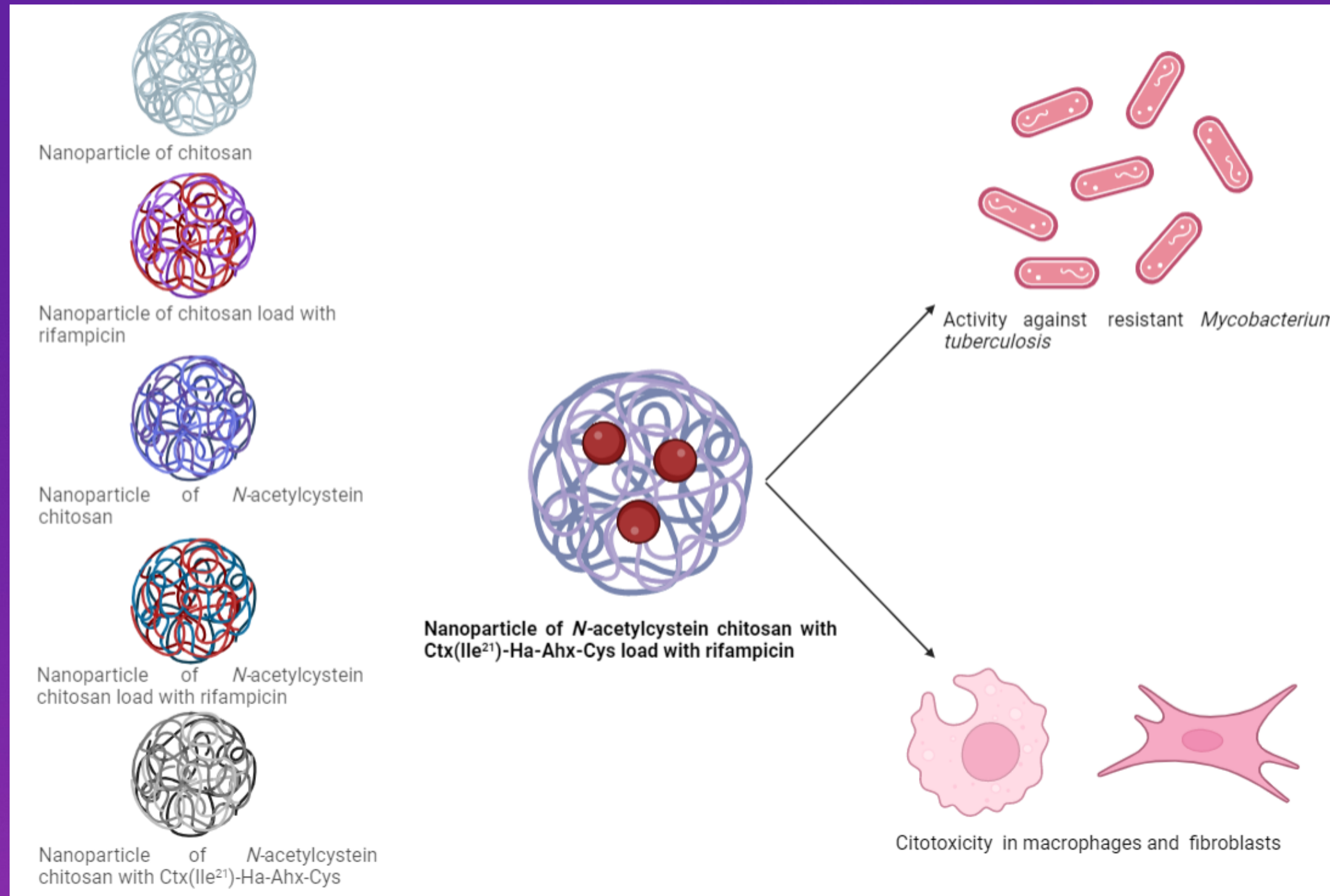
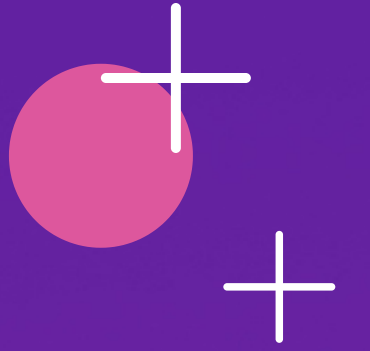
Introduction

9. Structure

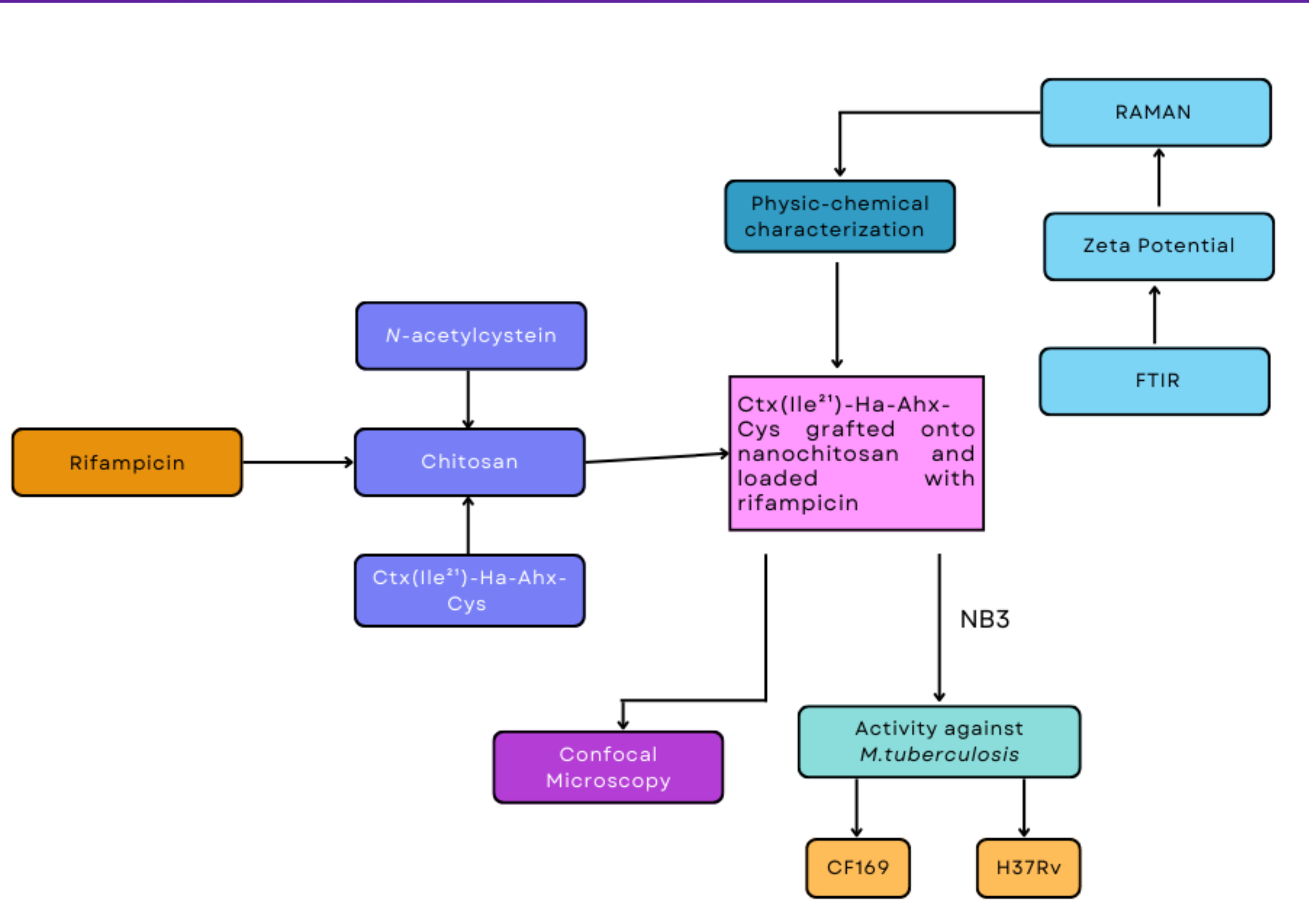


ROQUE-BORDA, Cesar Augusto et al. Conjugation of Ctx (Ile²¹)-Ha Antimicrobial Peptides to Chitosan Ultrathin Films by N-Acetylcysteine Improves Peptide Physicochemical Properties and Enhances Biological Activity. ACS omega, v. 7, n. 32, p. 28238-28247, 2022.

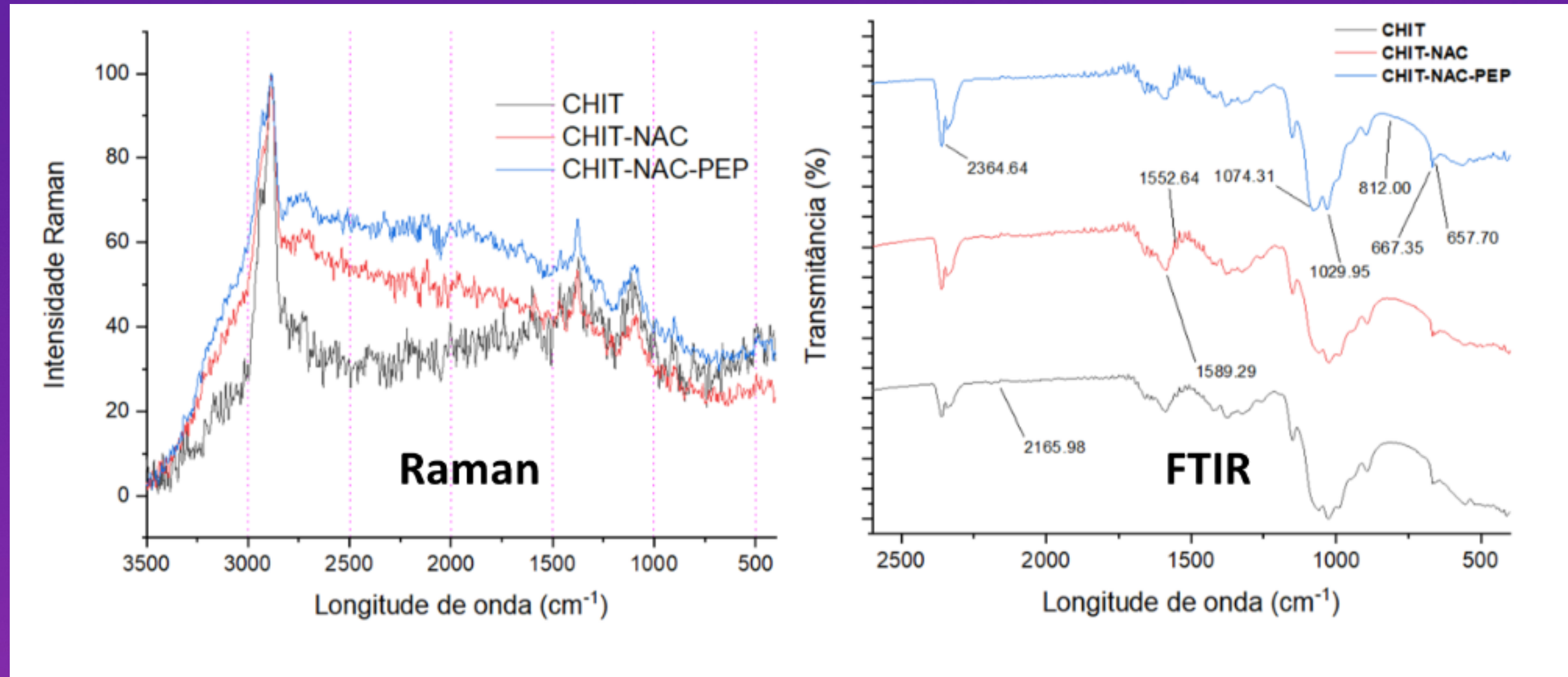
Objective



Methods



Results and discussion

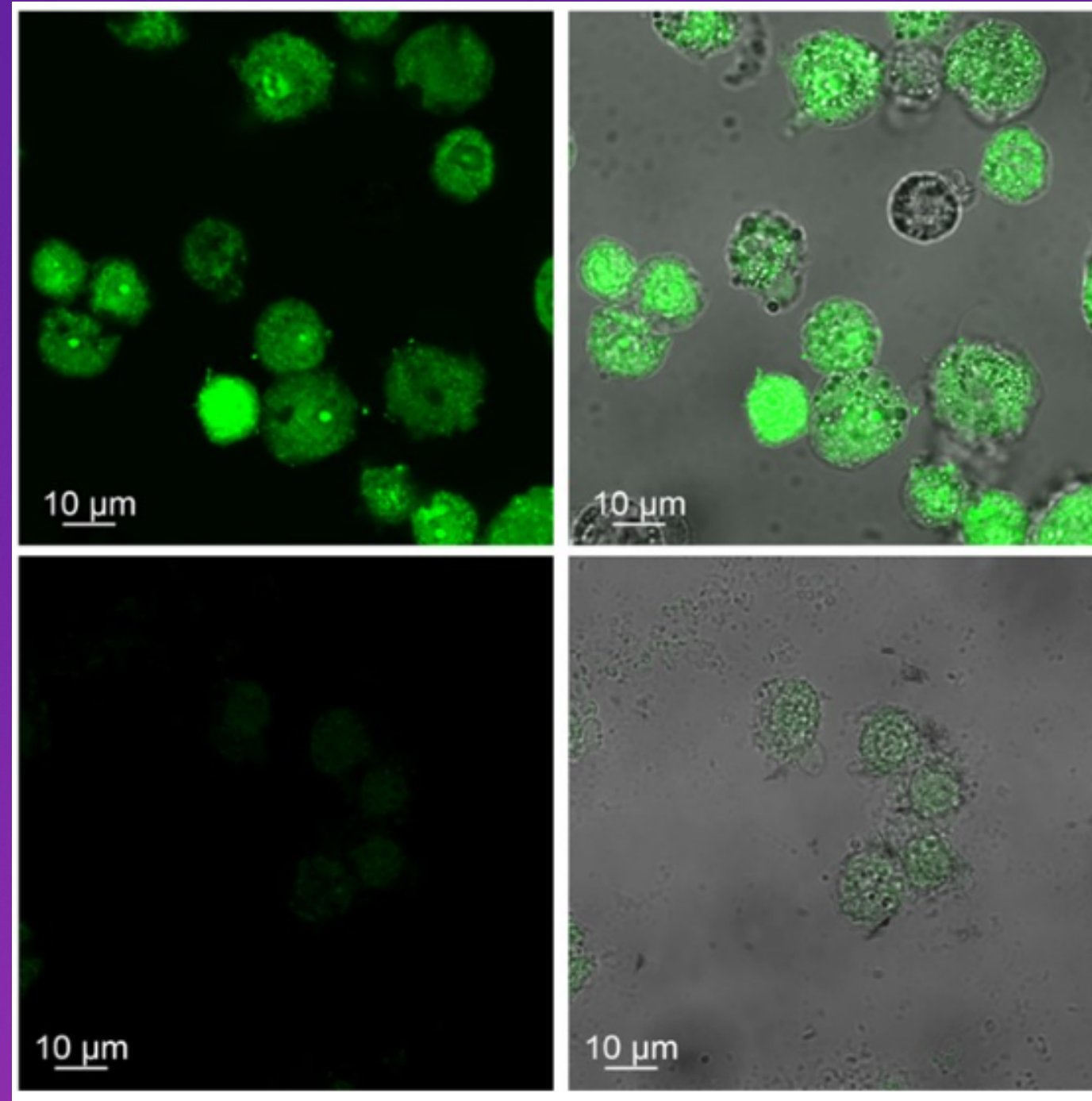


Results and discussion

Compound	MIC (ug/mL)	
	CF169	H37Rv
NPQ + Rif	0,977	< 0,977
Rifampicin	25	< 0,977

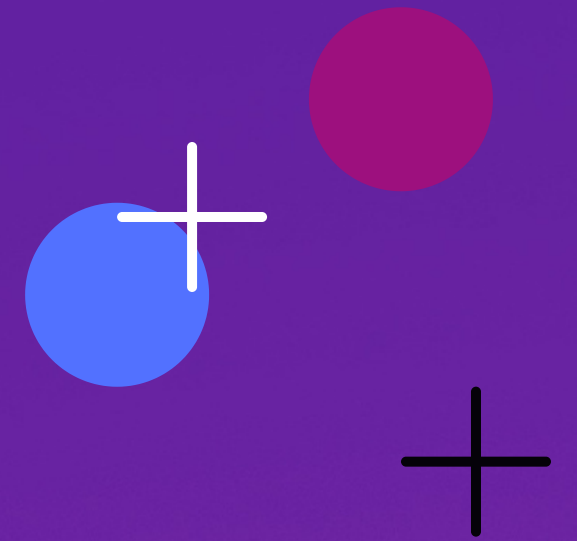
Results and discussion

- Zeta potential= +30mV

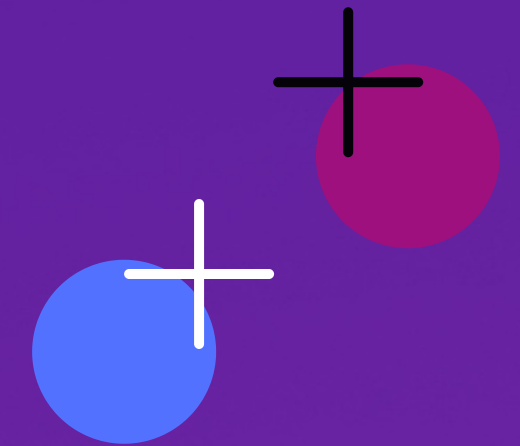


Conclusion

It can be concluded that the antimicrobial peptide Ctx(Ile²¹)-Ha-Ahx-Cys grafted onto nanochitosan was able to sensitize an strain extremely resistance of *Mycobacterium tuberculosis* and intensify the effect of rifampicin, drug obsolete against CF169.

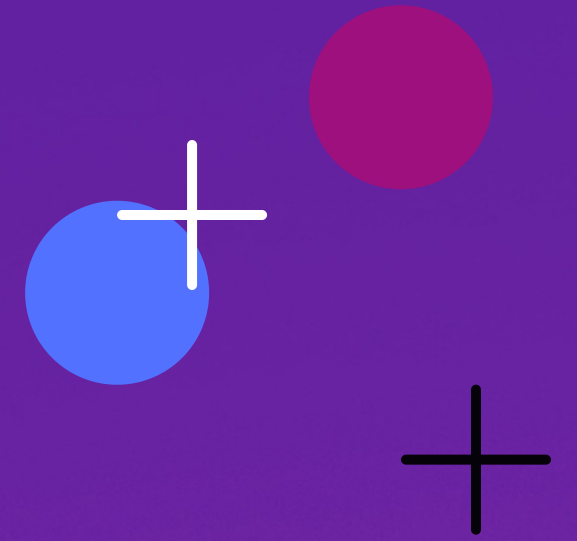


Acknowledgments



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Thank you!

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